

**Mississippi Transitional Refresher Course
Pediatric Endotracheal Intubation
Course Objectives**

Upon completion of this course, the student will be able to:

1. Identify respiratory anatomy of the pediatric patient when given an unlabeled diagram.
2. List four differences between pediatric and adult airways.
3. Discuss indications, contraindications, advantages and disadvantages of intubating a pediatric patient.
4. Differentiate between the two types of laryngoscope blades.
5. Assemble appropriate equipment needed for intubating a pediatric patient.
6. Demonstrate proper technique on a pediatric manikin for intubating, including insertion, ventilation, checking tube placement.

Mississippi Transitional Refresher Course

Pediatric Endotracheal Intubation

Course Outline

Endotracheal intubation is the process of placing an open-ended tube into the trachea to secure the airway and improve ventilation. Controlling the airway is the most crucial skill in the assessment and management of any patient. Pediatric patients, unlike adults, rapidly respond to aggressive ventilation and oxygenation. Endotracheal intubation provides the most secure airway in the prehospital setting. The pediatric airway is anatomically different from that of the adult and requires special handling and equipment. Some of the anatomical differences are:

- A head that is relatively larger than the neck and torso
- Small face with a relatively flat nasal bridge
- Large tongue in relation to mouth
- The larynx is more anterior and at the level of the cricoid cartilage
- Smallest diameter of the airway is subglottic
- Hyperextension of the neck may occlude airway rather than assist visualization

1. INDICATIONS:

1. Any child who is unable to protect his/her own airway
2. Ineffective BVM ventilations
3. Tracheal suctioning of the neonate

2. CONTRAINDICATIONS:

1. There are no contraindications, however special precautions should be taken with the trauma patient. Cervical alignment must be maintained during laryngoscopy and tube placement.

3. COMPLICATIONS:

1. Reflex bradycardia
2. Laceration of vocal cords if blade advances too far

4. EQUIPMENT:

1. Suction device with appropriate size catheters and bulb syringes
2. Oxygen
3. Pediatric BVM with reservoir bag
4. Laryngoscope handle and variety of pediatric blades (sizes 0,1,2)
5. Spare laryngoscope light bulbs

6. ETTs (2.5 to 6.5 mm id)
7. 10 cc syringe
8. Water-soluble lubricant
9. 1-inch tape
10. Pediatric stylet
11. Gloves
12. Eye protection

5. PROCEDURE:

1. Observe body substance isolation
2. Connect cardiac monitor and pulse oximeter (Stop procedure if pulse drops below 80 and O₂ saturation drops to less than 90% and hyperventilate for 2 minutes).
3. Position the head and hyperventilate the patient with a BVM and high flow oxygen. Because of the relatively large head size, some flexion of the head may naturally occur. It may be necessary to extend the head slightly so that the face looks up and provides an open airway.
4. Select and check the proper equipment. Insert stylet into the ETT and lubricate the tube with a water-soluble lubricant. You may need to lubricate the stylet due to tube size.
5. Reposition the nontraumatized child by placing a small towel under the shoulders. This position facilitates visualization of the airway because of the anatomic differences.
6. Holding the laryngoscope in your left hand, introduce it into the right side of the child's mouth. Sweep the tongue to the left side and simultaneously lift the chin forward. Expose the vocal cords by lifting the epiglottis with the tip of the Miller blade. Be careful not to advance the blade too far and accidentally lacerate the vocal cords.
7. Gently insert the ETT until you see the tip of the tube advance past the glottic opening.
8. Remove the laryngoscope blade and stylet, while holding the tube in place with your right hand.
9. If using a cuffed tube as indicated for an 8-year-old child or older, inflate the cuff. Ventilate the patient using a pediatric BVM and watch for chest rise. Confirm placement by auscultating the chest bilaterally and the epigastrium with a stethoscope, or end-tidal carbon dioxide detector.
10. Secure the tube, by taping it to the maxilla.

11. Reassess tube placement after taping. Any substantial movement may cause displacement of the tube. Reassess often.

**Mississippi Transitional Refresher Course
Pediatric Intraosseous Cannulation
Course Objectives**

Upon completion of this course, the student will be able to:

1. Explain rationale for performing intraosseous cannulation.
2. Identify proper anatomical structures for procedure.
3. Discuss indications, contraindications, and complications of intraosseous cannulation.
4. 4. Assemble appropriate equipment needed for intraosseous cannulation.
5. Demonstrate procedure on manikin.

Mississippi Transitional Refresher Course

Pediatric Intraosseous Infusion

Course Outline

Intraosseous infusion (IO), is defined as a puncture into the medullary cavity of a bone that provides the care provider with a rapid access route for fluids and medications. This procedure is reserved for patients up to 6 years of age.

Three sites are suggested for the puncture. The most common site used is the proximal tibia, since the tibial plateau has a broad, flat surface. The distal tibia and distal femur can also be accessed. It should be noted that the IO site is for temporary use only. Prolonged use of IO infusion has proven to lead to infection more often than traditional IVS.

1. INDICATION:

1. Attempts at establishing a peripheral line have failed, as a rule you are allowed 2 attempts or 90 seconds.
2. Cardiac arrest
3. Multi system trauma with associated shock and/or severe hypovolemia
4. Severe dehydration associated with vascular collapse and/or loss of consciousness
5. Any child who is unresponsive and in need of immediate drug or fluid resuscitation (burns, status asthmaticus, status epilepticus, sepsis)

2. CONTRAINDICATIONS:

1. Fracture above the insertion site
2. Prior infection at the insertion site
3. Site used for previous insertion
4. History of bone disease

3. EQUIPMENT:

1. IV solution
2. IV tubing (microdrip or Buretrol-type)
3. Commercial I/O or bone marrow biopsy needle
4. Povidone-iodine or alcohol swabs
5. Antibiotic ointment
6. 1-inch tape
7. Several rolls of 2-3-inch Kerlex
8. 2 10-cc syringes

9. Injectable sterile saline
10. Gloves
11. Eye Protection

4. PROCEDURE:

1. Observe body substance isolation
2. Assemble and prepare equipment to be used
3. Identify landmark for insertion, preferably the anteromedial aspect of the proximal tibia, approximately 1 to 3 cm below the tibial tuberosity.
4. Cleanse the site.
5. Using a twisting motion, introduce the needle using a 90-degree inferior puncture, away from the joint and epiphyseal plate. A decrease in resistance can be felt as the needle enters the marrow. Stabilize the needle once it has been inserted. **DO NOT PUT YOUR HAND ON THE OTHER SIDE OF THE BONE TO STABILIZE.**
6. Remove the stylet.
7. Attach a 10-cc syringe and aspirate bone marrow to verify the location of the needle. In a child with severe shock marrow may not be aspirated, even if the needle is in place. Remove the syringe.
8. Attach another 10-cc syringe filled with sterile water. Inject 5-10 cc of saline to clear the lumen of the needle.
9. Attach the IV and adjust the flow rate.
10. Place antibiotic ointment around the site and secure with Kerlex and tape.
11. Following the administration of a medication, 10-cc of saline should be administered to expedite absorption into the circulatory system.
12. Monitor site for soft tissue swelling, which may indicate that the needle has become dislodged.
13. Document all sites.

**Mississippi Transitional Refresher Course
Pediatric Needle Chest Decompression
Course Objectives**

Upon completion of this course, the student will be able to:

1. Discuss specific anatomic structures for needle decompression.
2. Discuss indications, contraindications, advantages and disadvantages of needle decompression.
3. Discuss complications of needle decompression.
4. Assemble appropriate equipment for needle decompression.
5. Demonstrate proper needle decompression technique on a manikin.

Mississippi Transitional Refresher Course

Pediatric Needle Chest Decompression

Course Outline

Needle decompression of the chest should be restricted to rapidly deteriorating patients. This procedure is placement of a needle through the chest wall of a patient whose lung has collapsed as a result of a one-way valve air leak. Some common causes of tension pneumothorax:

- Mechanical ventilation
- Spontaneous pneumothorax from ruptured emphysematous blebs
- Chest trauma, blunt or penetrating
- Fractured rib(s) or flail sternum secondary to chest compressions

1. INDICATIONS:

1. Thoracic decompression is indicated in patients with clinical signs and symptoms consistent with tension pneumothorax, clinical signs are;

1. Restlessness and agitation
2. Increased airway resistance on ventilating
3. Neck vein distention
4. Respiratory distress--severe dyspnea, tachypnea, air hunger in the conscious patient
5. Unilateral absence of breath sounds on affected side
6. Hyperresonance to percussion on affected side
7. Hypotension
8. Cyanosis
9. Tracheal deviation toward unaffected side
10. Respiratory arrest

2. CONTRAINDICATIONS:

1. There are no contraindications for patients meet the above criteria.

3. COMPLICATIONS: (possible)

1. If a pneumothorax is not present, opening the pleural space will complicate the patient's condition by causing a pneumothorax in 10% to 20% of cases
2. Placing the needle too high or too anterior in the chest may injure a vessel (subclavian artery or vein) or the heart.
3. Attempts to vent the chest below the 5th intercostal space may result in trauma to the liver or the spleen.
4. EQUIPMENT:
 1. Large-bore over-the-needle catheter (16-18 gauge)
 2. 30-cc syringe
 3. Povidone-iodine preps
 4. Finger cut from a sterile glove for flutter valve
 5. Sterile dressing
 6. Sterile gloves
5. PROCEDURE:
 1. Observe body substance isolation precautions
 2. Locate the landmark for decompression on the affected side.
 3. Clean site povidone-iodine swabs
 4. Attach a 30-50 cc syringe to a 16-18-gauge over-the-needle catheter.
 5. Insert angiocath in mid-clavicular line, on the affected side into second or third intercostal space. The needle should slide off the upper edge of the rib.
 6. On entering the thoracic cavity with a tension pneumothorax, you should feel a pop, and then, depending on the level of ambient noise, you may hear a "hiss" as air is decompressed. Alternately, you may see the plunger of the syringe push outward.
 7. Advance the catheter and remove the needle.
 8. A finger cut from a nonpowdered glove may be used to create a one-way valve allowing air to escape, but not enter, the chest. Place a finger from a surgical glove over the catheter hub. Cut a small hole in the end of the finger to make a one-way or flutter valve. Secure the glove finger to the catheter, using tape or a rubber band. The flutter valve collapses during inspiration and opens during expiration.
 9. Secure the catheter to the chest wall with a dressing and tape.

10. If no air is obtained, remove the needle and cover site with dressing and inform receiving hospital of attempt.
11. Continue to reassess adequacy of ventilation.
12. Document procedure.

**Mississippi Transitional Refresher Course
Pediatric Needle Cricothyroidotomy
Course Objectives**

Paramedic will be able to:

1. Explain rationale for performing needle cricothyroidotomy on pediatric patient.
2. Identify anatomic structures of airway when given an unlabeled diagram.
3. List indications and contraindications of needle cricothyroidotomy.
4. List complications of needle cricothyroidotomy.
5. Identify and list equipment needed to perform a needle cricothyroidotomy.
6. Discuss the need for aseptic technique.
7. Demonstrate needle cricothyroidotomy on manikin.

Mississippi Transitional Refresher Course

Pediatric Needle Cricothyroidotomy

Course Outline

This procedure is difficult and dangerous in the pediatric patient, and should therefore be attempted only by paramedics with experience. Needle cricothyroidotomy is a technique that can be lifesaving. NCT involves the insertion of a catheter through the cricothyroid membrane. The catheter is then connected to a high-pressure oxygen source, and oxygen is delivered intermittently into the trachea.

1. INDICATIONS:

1. The only indication for cricothyroidotomy is the inability to secure an airway by other procedures such as endotracheal intubations (e.g., cervical spine trauma, maxillofacial trauma; and oropharyngeal obstruction caused by foreign body, masses, infections (epiglottitis), or edema resulting from allergic reactions or inhalation injury.

2. CONTRAINDICATIONS:

1. Possibility of establishing an easier and less invasive airway rapidly.
2. Acute laryngeal disorders such as laryngeal fractures that cause distortion or obliteration of landmarks (e.g., bleeding disorders, injury or obstruction below the level of the cricothyroid membrane).
3. Obstruction above the level of the vocal cords, because air will not be able to escape during exhalation.

3. COMPLICATIONS:

1. Pneumothorax
2. Pneumomediastinum
3. Subcutaneous emphysema
4. Catheter dislodgement
5. Hemorrhage
6. Esophageal or mediastinal injury
7. Hypercarbia

4. EQUIPMENT:

1. 14-gauge or larger 2" over-the-needle catheter, (for children under 12 years use 14-gauge 1 3/4" over-the-needle catheter).

2. 10cc syringe
 3. Three-way stopcock
 4. Two standard oxygen tubings, 4 to 5 feet each
 5. Y-connector
 6. Oxygen cylinder coupled with 50-psi step-down regulator and needle flow meter (e.g., Bourdon-type flow gauge and regulator).
 7. Povidine-iodine swabs
 8. Adhesive tape
 9. Suction equipment
 10. Gloves
 11. Goggles
5. PROCEDURE:
1. Observe body substance isolation precautions
 2. Palpate the cricothyroid membrane anteriorly between thyroid and cricoid cartilage.
 3. Prep the skin with two povidone-iodine swabs
 4. You may attach the syringe to the over-the-needle catheter, or you may elect to use the catheter-needle assembly by itself. This is a personal preference, some think that using a syringe makes the unit less stable. Puncture the skin over the cricothyroid membrane.
 5. Advance the needle at a 45-degree angle caudally (toward the feet).
 6. Carefully push the needle until it “pops” into the trachea (aspirating on the syringe as you advance the needle, if using a syringe).
 7. Free movement of air confirms that you are in the trachea.
 8. Advance the plastic catheter over the needle, holding the needle stationary, until the catheter hub comes to rest against the skin.
 9. Holding the catheter securely, remove the needle.

10. Reconfirm the position of the catheter. Securely tape the catheter to the skin.
 11. Attach the three-way stopcock to the catheter hub. Connect one end of the oxygen tubing to the stopcock.
 12. Connect the other end of the oxygen tubing to the Y-connector. Attach the second oxygen tubing to the other arm of the Y-connector. This tubing is then connected to the flowmeter on the oxygen cylinder. These connections should be made before the procedure to save time.
 13. To ventilate the patient, open the regulator and set it at maximum rate (greater than 15L/min). Occlude the third arm of the Y-connector with your thumb. Air will then flow into the lungs. When you release the occlusion on the Y-connector, air flow will be diverted outward, allowing the lungs to recoil and collapse. By alternately occluding and releasing thumb pressure on the connector (1 second on and 4 seconds off), you can maintain adequate ventilation for approximately 30 minutes.
 14. Constantly monitor the patient's breath sounds, ventilation status and color. Adequate exhalation never fully occurs with this technique. The patient may develop hypercarbia (increased CO₂) and increased air pressure in the lungs, possibly causing the alveoli to rupture.
 15. Document the procedure.
6. Alternative to Jet Ventilation:
1. Insert large bore catheter (14 gauge) through cricothyroid membrane as described above.
 2. Attach the plastic adapter from a 3.5 ETT to the hub of the catheter.
 3. Fit a BVM unit to the adapter and ventilate using the bag. Allow enough time for exhalation through the small caliber catheter.

Mississippi Transitional Refresher Course

Umbilical Vein Cannulation

Course Outline

Umbilical vein cannulation (UVC) is the process of gaining intravenous access by placing a specialized catheter or tubing into the umbilical vein of the neonatal umbilicus. This procedure allows a paramedic to administer fluids or medications when percutaneous cannulation into a small vein is impossible.

The umbilical cord contains three vessels: Two arteries and one vein. The vein in the umbilical cord has a thin wall and is larger than the arteries, which are thick walled and usually paired.

1. INDICATIONS:

1. Neonatal patient, less than one week of age, in need of IV access, but does not have accessible peripheral veins.

2. CONTRAINDICATIONS:

1. There are no significant contraindications, when used in a life-threatening illness or injury.

3. COMPLICATIONS:

1. Local and systemic infection
2. Thrombus formation
3. Possible emboli
4. Too aggressive or poor placement may result in the catheter entering portal system of the liver.

4. EQUIPMENT:

1. Sterile scalpel
2. Umbilical tape
3. Two sterile, delicately curved 5-inch hemostats
4. Sterile 4x4
5. No. 3.5, or 5, French umbilical catheter
6. Luer-lock disposable stopcock
7. Sterile scissors
8. Povidone-iodine swabs
9. Intravenous solution

10. Microdrip or Buretrol-type solution sets
11. Heparin (concentration of 10 U/1ml of fluid)
12. Gloves
13. Eye Protection
14. Sterile drapes

5. PROCEDURE:

1. BSI
2. Prepare equipment
3. Restrain the infant, if necessary
4. Clean and drape the area. The umbilicus should be cleaned using povidone-iodine solution.
5. Place a loose tie of umbilical tape around the base of the umbilicus.
6. Locate the two umbilical arteries and one umbilical vein. The vein has a thin wall and larger lumen compared to the thick walls and smaller lumen of the umbilical arteries. Trim the cord approximately 1 cm to provide a fresh opening.
7. Using a sterile hemostat, insert the tip of the hemostat into the lumen of the vein. Gently open the hemostat to dilate the vessel.
8. Introduce and advance a heparinized-saline flushed umbilical catheter approximately 2 to 4 inches. This will place the catheter into the inferior vena cava of the infant. You should note blood return after inserting the catheter. Do not force the catheter because severe hemorrhage or liver injury may occur.
9. Hook up the catheter to a three-way stopcock. Flush the catheter with 1 ml of heparin solution.
10. Secure the catheter, using the piece of umbilical tape, by tying the tape around the umbilicus.
11. After securing the catheter, hook the IV tubing to the stopcock to allow for the administration of fluids and/or medications.
12. Monitor the umbilicus for bleeding. A dressing is usually not used in this situation so that the umbilicus can be viewed.
13. Document procedure.

**Mississippi Transitional Refresher Course
Umbilical Cannulation
Course Objectives**

Upon completion of this course, the student will be able to:

1. Identify proper anatomical structures.
2. Explain rationale for performing umbilical cannulation.
3. Discuss indications, contraindications, and complications of umbilical cannulation.
4. Assemble appropriate equipment needed for umbilical cannulation.
5. Demonstrate procedure on mannikin.